



European
Commission

J R C S C I E N C E F O R P O L I C Y R E P O R T

How to promote
water intake
in **schools:** a toolkit

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2016



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JRC Science Hub

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JRC100991

EUR 27945 EN

PDF	ISBN 978-92-79-58777-1	ISSN 1831-9424	doi:10.2788/95048	LB-NA-27945-EN-N
Print	ISBN 978-92-79-58776-4	ISSN 1018-5593	doi:10.2788/81444	LB-NA-27945-EN-C

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How to cite: Stefan Storcksdieck genannt Bonsmann, Tsz Ning Mak, Sandra Caldeira and Jan Wollgast; How to promote water intake in schools: a toolkit; EUR 27945 EN; doi:10.2788/95048

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Abstract

Schools are a key environment to teach children healthy hydration and form long-term positive beverage consumption behaviours. School-based interventions can reach large groups of children of all social classes, and messages learned may be taken home to impact behaviours in the family and elsewhere. As children often consume at least one meal or snack during a school day, promoting healthy beverage choices in these meals may reinforce their healthy nutrition knowledge and behaviour. Along these lines, having a policy on healthy school nutrition appears to help reduce SSB intake. This policy toolkit aims to support the EU Action Plan on Childhood Obesity 2014-2020, particularly the area for action 'Promote healthier environments, especially in schools and pre-schools'. This area aims to establish children's health as a priority at schools and has as one of its objectives to 'increase [...] water intake in schools'.



How to promote water intake in schools: a toolkit

Using this toolkit and its content

This toolkit should be seen as a guide and a source of inspiration for starting actions in schools to promote water intake among children and adolescents. Here below are its key messages and how to use the toolkit to address them.

1. Consider which intervention and which components are appropriate for your school setting, the age and population group(s) you are targeting.

- Consult *Tables 1-3* for education, environment and parental components extracted from interventions that have increased water intake in children or adolescents.
- Refer to our overview of original studies (*Annex III*, online only: link on *p. 5*) to select those matching your components of choice and consult the detailed intervention table for further insights on study design, implementation, effect sizes, etc.

2. Consider using multiple intervention components.

- Combining efforts at education, environment and parent level ups the chances for the intervention to be effective.
- Again, you can refer to *Tables 1-3* for tested intervention components and the detailed overview (*Annex III*, online only: link on *p. 5*) to see how previous interventions have combined them successfully.

3. Plan and implement the intervention thoroughly.

- Define your stakeholders; consult *Table 4* and *Table 5* for expert views and experiences regarding key stakeholders and how to engage them.
- Anticipating challenges, preparing contingency plans, and delivering the intervention faithfully, all contribute to the success of the intervention; consult *Table 6* for feasibility and sustainability issues as well as potential side effects and equity concerns related to these types of interventions.

4. Make time for proper evaluation.

- Evaluation needs to be planned in advance; it is linked to the activities, outputs and indicators identified during the design phase of the intervention and will likely require baseline measurements and data.
- Evaluating the outcome as well as the process helps define the extent of success and offers insights for improvement, thus promoting intervention durability. Evaluation tools are freely available; *Table 7* provides an example of how to use them. Use our *Additional resources* section for more guidance and examples.

5. Still have questions?

Contact us at jrc-nutrition@ec.europa.eu.



Why promote water intake?

Water intake is essential for the functions of the body and for adequate hydration of body tissues. Water requirements vary between individuals and by environmental conditions. The European Food Safety Authority has defined adequate daily intakes for specific age groups including children¹ (see *Infobox*). Recent data indicate that one third or more of European children and adolescents do not meet these recommendations.² On the other hand, soft drinks including sugar-sweetened beverages (SSB) make a sizable contribution to the total fluid intake in these age groups.³ The World Health Organization notes increasing concern about the impact of sugar intakes, particularly from SSB, on the risk of non-communicable diseases.⁴ Consequently, public health strategies that aim to increase water or decrease SSB intake early on are needed.

Infobox: EFSA recommendations

Adequate daily water intakes range from 1.3 l in 2-3 year-olds up to 2 and 2.5 l for girls and boys, respectively, aged 14 years and older.¹



Why intervene in schools?

Schools are a key environment that can teach children healthy hydration and form long-term positive beverage consumption behaviours. School-based interventions can reach large groups of children of all social classes, and messages learned may be taken home to impact behaviours in the family and elsewhere. As children often consume at least one meal or snack at school, promoting healthy beverage choices in these meals may reinforce their healthy nutrition knowledge and behaviour.



Aims of this toolkit

This toolkit aims to support the *EU Action Plan on Childhood Obesity 2014-2020 (Action Plan)*,⁵ particularly the area for action entitled 'Promote healthier environments, especially in schools and pre-schools'. This area aims to establish children's health as a priority at schools and has as one of its objectives to increase water intake in schools.⁵ This toolkit aims to provide policy-makers with:

- Successful measures to promote water consumption and reduce SSBs intake in schools
- Support in implementing and evaluating these measures in schools

The process applied to achieve these aims is depicted in *Figure 1*.

1. EFSA Journal, 2010, 8(3), 1459. doi: <http://dx.doi.org/10.2903/j.efsa.2010.1459>.

2. Iglesia et al., *European Journal of Nutrition*, 2015, 54(Suppl 2):57–67. doi: <http://dx.doi.org/10.1007/s00394-015-0946-6>.

3. Guelinckx et al., *European Journal of Nutrition*, 2015, 54(Suppl 2): 69–79. doi: <http://dx.doi.org/10.1007/s00394-015-0955-5>.

4. *Guideline: Sugars intake for adults and children*. Geneva: World Health Organization, 2015. http://apps.who.int/iris/bitstream/10665/149782/1/9789241549028_eng.pdf?ua=1.

5. EU Action Plan on Childhood Obesity 2014-2020. http://ec.europa.eu/health/nutrition_physical_activity/docs/childhoodobesity_action-plan_2014_2020_en.pdf.

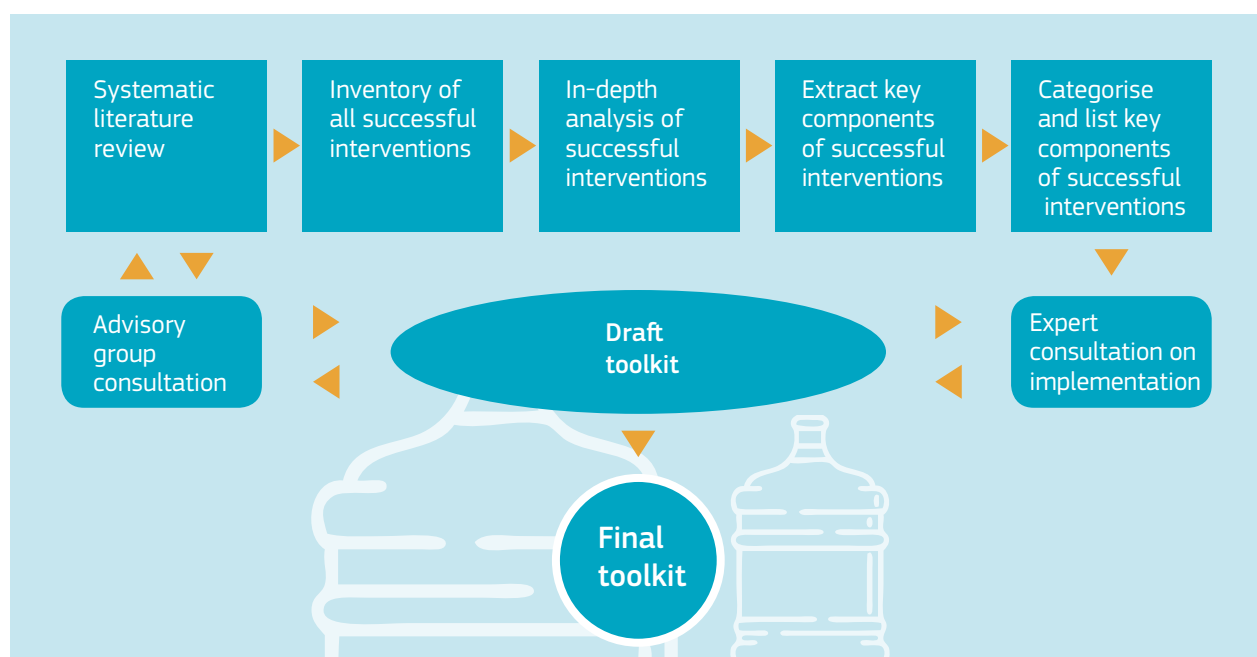


Figure 1. Process workflow used in the preparation of this policy toolkit.



What measures work to promote water and reduce SSB consumption in schools?

The *Tables 1-3* below list individual components of effective school-based interventions to promote water consumption or to reduce SSB intake in children and adolescents. These measures were identified through an exhaustive analysis of the scientific literature (see *Annex I* for details). Interventions were deemed effective or successful if they achieved significant increases in water intake or decreases in SSB intake based on statistical analysis. For reporting purposes, the various components are categorised into education (*Table 1*), environment (*Table 2*), and parental/family components (*Table 3*).

Table 1. *Education components* of school interventions that led to increased intake of water or reduced consumption of sugar-sweetened beverages (SSB) in children or adolescents (3-18 years).*

Classroom-based learning	Experiential learning	Games and competitions (± rewards and incentives)	Behaviour change approaches
Curricular Lessons/sessions to teach children about the importance of water intake Cross curricular Embedding teaching of hydration into multiple subjects, <i>e.g.</i> science, physical education; reiterate messages learned from sessions in other subjects/lessons	Demonstration of effects of SSBs on dental caries 	Quizzes Testing children's knowledge on hydration learned from lessons Music Singing, rapping and song writing competitions	Role models Including using peers and cartoon characters to encourage water consumption Goal setting and action planning Mainly for older children to set their own targets on fluid consumption

* In this toolkit, education components are those that target school children directly.

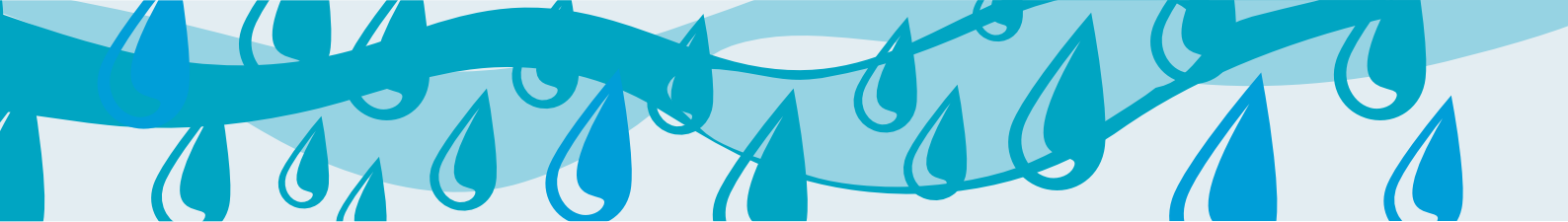
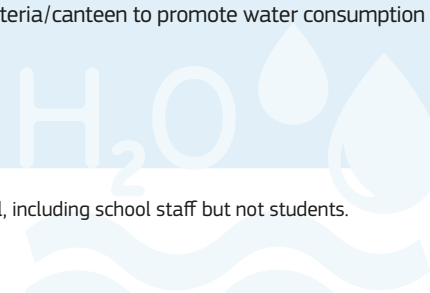


Table 1. (Cont.)

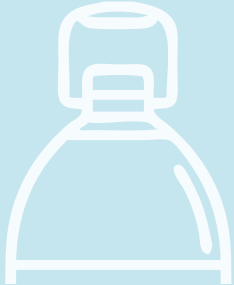
Classroom-based learning	Experiential learning	Games and competitions (± rewards and incentives)	Behaviour change approaches
Homework Reinforcing healthy fluid intake messages from lessons Videos/movies/DVDs Delivering healthy fluid intake messages using multimedia, cartoons, puppet shows etc. Printed materials for children and parents Take-home information sheets or newsletters to reinforce messages learned from lessons Web-tools Using blogs, project websites to deliver further information		Writing and drawing competitions	Individual feedback and peer comparison Including using web-tools, keeping diary, involving a 'coach' to provide feedback on behaviour; comparing own behaviour with peers Identifying risk behaviours Mainly in adolescents/older children

Table 2. *Environment components* of school interventions that led to increased water intake or reduced consumption of sugar-sweetened beverages (SSB) in children or adolescents (3-18 years).*

Availability of water	Restrict access to SSBs	Changes at point of purchase (POP) or consumption (POC)
Installing water fountains Installing water filters Provision of free water bottles for refilling	Restrict leaving school grounds during school hours Limiting accessibility to shops near school Reduce portion sizes of SSBs e.g. provide smaller cans instead of bottles Restrict access to vending machines or tuck shops e.g. only after lunch time	Providing information at POP and POC To raise awareness of sugar/calories of SSBs; using traffic light to suggest healthier options Architectural changes Using banners/posters around school ground/cafeteria/canteen to promote water consumption 

* In this toolkit environment components are those that target the environment of the school, including school staff but not students.

Table 3. Parental/family components* of school interventions that led to increased water intake or reduced consumption of sugar-sweetened beverages (SSB) in children or adolescents (3-18 years).

Parents evening and information sessions to reduce purchase of SSBs and increase provision of water or non-sugared alternatives Information material printed materials, websites for parents, follow-up phone calls Parental role modelling, goal setting for parents and children Take-home incentives gifts, gadgets, refrigerator water dispensers	
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* in this toolkit parental/family components are those that involve parents to reinforce the school intervention.

All of the effective school-based interventions considered here adopt a multi-component approach (see *Figure 2*); they combine components from the education theme with components from the environment theme to reinforce the learning of healthy hydration through changes to the school environment. Parental support was commonly sought to extend effects beyond the school setting.

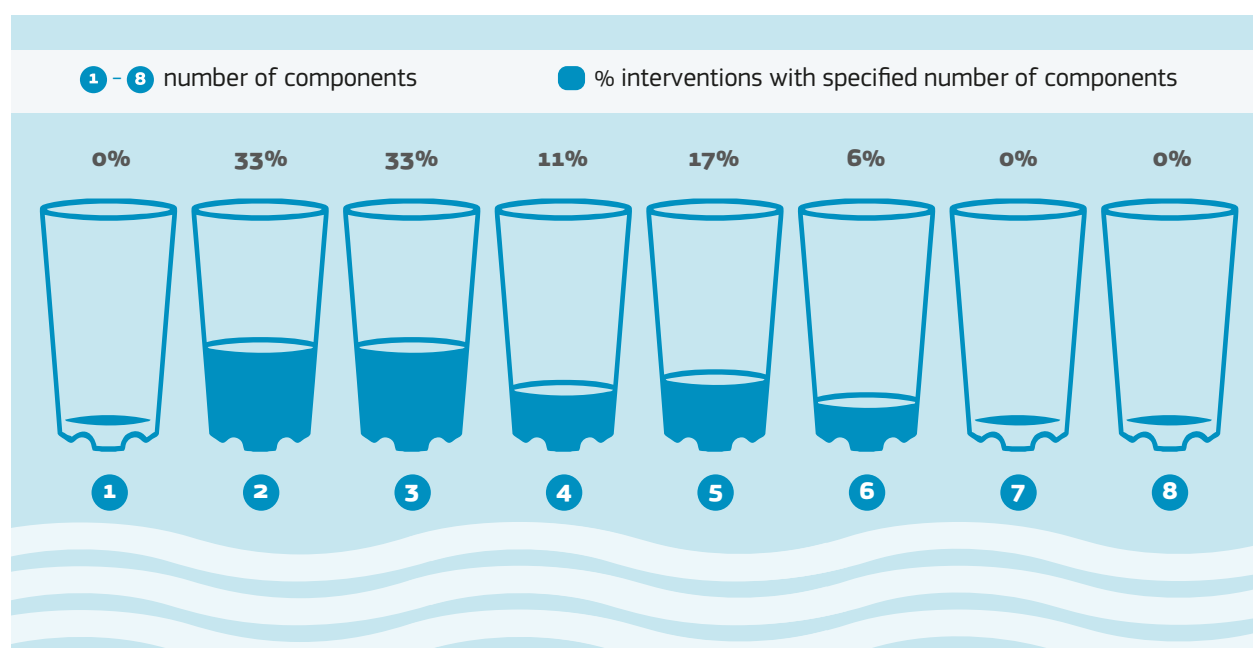


Figure 2. Breakdown of analysed, effective interventions (n=18) by number of components used.

A strategy where multiple components from the above tables are used in parallel in schools ups the chances for the intervention to be effective. Detailed descriptions of how these components have been implemented and evaluated in successful school-based interventions can be found in *Annex III* (online only: <http://publications.jrc.ec.europa.eu/repository/handle/JRC100991>).



Implementing and evaluating school-based interventions to promote water intake or reduce SSB consumption

The key components proposed in the tables above have successfully increased water intake or reduced SSB consumption in children and adolescents. The success of an intervention is however not solely based on its content; it is possible that the same components have also been reported and used in comparable, yet unsuccessful interventions. A well designed and executed implementation is vital; this section discusses several implementation issues and offers suggestions and learnings from national public health experts (see *Annex II* for interview details).

One major focus should be on engaging the right stakeholders. *Table 4* and *Table 5* provide expert opinions on who these stakeholders are, likely resistance issues, and how to gain their support. The age of the target group and the context of the schools (*e.g.* school size, human and financial resources, existing facilities and infrastructures, access to local resources and learning facilities) need consideration, too. Other feasibility issues—including limiting and leveraging factors to the success of the interventions—as well as equity and sustainability issues and potential side effects are detailed in *Table 6*.

Table 4. Which stakeholders to consider for school-based, educational water interventions, and how to engage them?⁶

Stakeholders	Resistance/issues	Gaining their support
School masters, teachers, other school staff 	• Schools are very busy, may need convincing to participate in programmes to increase water intake in children • Activity not well prepared and agreed with the school in advance (individual school working plan is prepared on annual basis, any activity has to be 'pre-agreed' in time) or posing too much additional administrative or work burden • Schools try to preserve their core business of academic education	• Cost for schools should be low (ideally none) • Offer them freely downloadable materials, <i>e.g.</i> posters and leaflets from websites can be helpful for schools. Printing cost borne/subsidised by authority will help • Use incentives such as media coverage, awards • Use evaluation, <i>e.g.</i> questionnaire at start and end of intervention to show achievements • Include good communication strategy, <i>e.g.</i> produce videos and other communications • Be adaptable to make intervention sustainable and more feasible for schools (<i>e.g.</i> change timing or duration) • Use good accompanying measures, <i>e.g.</i> working in schools with teachers, parents, children • Important to link public health topics to other topics within curricula • Make benefits of participation clear to them
Private sector (<i>e.g.</i> water and soft drinks suppliers)	• Government may promote tap water, whereas industry tries to sell bottled water	
Children	• Matter of taste and perception, especially with so much variety of soft drinks on the market. It's difficult to change the taste children are used to • Adolescents may not switch from SSB (teas, soft drinks) to water, but to alcoholic drinks	• May need additional awareness raising campaigns (<i>e.g.</i> involving celebrities) • Information web point (<i>e.g.</i> where children can click on pictures of drinks and acquire information on sugar content in soft drinks) Abbreviations: NGO: non-governmental organisation SSB: sugar-sweetened beverages

6. Information collated from semi-structured interviews with national public health or education institutions of various EU Member States. See *Annex II* for interview structure details.

Table 5. Which stakeholders to consider for school-based, environmental water interventions, and how to engage them?⁶

Stakeholders	Resistance/issues	Gaining their support
Other stakeholders include: National government departments (e.g. Ministries of Health, Education, Science, Sport, Environment); primary healthcare system (school doctors, paediatricians, dentists, etc); parents; dieticians; environmental protection organisations		
Ministry of Health, National Public Health centres, Regional Health Inspectorates, Ministry of Education		• Political support from Cabinet of Ministers (adopt new norms/legislation)
Public Private Partnerships (partners include water providers (tap or bottled), caterers, vending services, industry and (local) supermarkets, as well as NGOs)	• Partners can have different time-scales and paths • Participation by industry can slow down progress, but is essential to reach the formulated goals	• Find ways to involve everybody in a balanced approach, including bottled waters industry as well as tap water partners and others • Every partner needs to have clear objectives and be responsible to meet the criteria formulated by the authority • Co-creation very important • Participation by industry can be essential to reach formulated goals
Schools (school boards, leadership and staff)	• May not see easy-to-access water provision as their core business. It can also compete with what a caterer or other stakeholder in the schools wants • National focus on collaboration and co-creation with the educational sector (schools) needed	• Offer support staff to visit, advise and evaluate schools
Food producers	• May be unhappy about school food standards in cafeterias, vending machines (e.g. allowing only healthy options like water or fruits and vegetables)	• Seek dialogue to arrive at compromise
Other stakeholders include: Municipalities; Ministry of Agriculture; school nurses; children; parents		Abbreviations: NGO: non-governmental organisation SSB: sugar-sweetened beverages

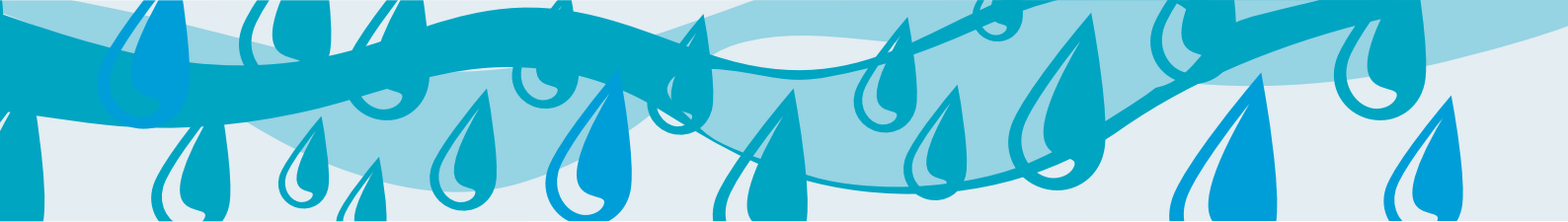
6. Information collated from semi-structured interviews with national public health or education institutions of various EU Member States. See *Annex II* for interview structure details.

Table 6. What other factors to consider when implementing education or environment interventions to increase water consumption in children?⁶

Feasibility issues: limiting factors	Feasibility issues: leverage points	Intervention sustainability issues	Equity issues	Potential positive side effects	Potential negative side effects
Need agreement and support from education authority, particularly if adding more content to the curriculum and involving multiple subjects Administrative burden and schools not seeing the benefit for the school Funding to provide water or water supply infrastructure Sometimes water supply/installations are difficult to reach/access by children	Demonstrate to the schools and teachers that the intervention works and benefits the children (e.g. learning process) as well as the teachers (e.g. teaching approach, or school results/performance) and the school. Pilot studies help to demonstrate if an intervention can be successful Multidisciplinary competence and understanding of the main drivers of different sectors is crucial for the success of the intervention	Water provision limited by insufficient number of companies to cover all schools. Not all schools receive free water in some countries Environment issues regarding use of bottled water: offer programme to schools to handle/ reuse the water bottles; or only employ tap water Encourage schools to think long-term and build drinking water fountains Guidelines or law on water provision important to ensure school compliance	There are few socio-economic (SE) issues related to water intake in schools; unclear if observation is genuine or due to lack of data/ evaluation on water projects to state otherwise. However, problem may be seen among minority populations If problem with providing potable water occurs in some remote areas, schools and communities should receive recommendations on how to treat water by the authority. Old water-wells may be a risk factor. Regular water quality control is needed In some countries, public water fountains are mostly found in less problematic areas, but not poor neighbourhoods For water promotion activities, gender-specific approaches and language barrier may need consideration	Increased water intake can lead to decrease in SSBs intake Children will learn about health, environmental and economic issues that are very closely linked to water Projects can stimulate networks which may lead to new collaborations or better support of existing schemes	Administration-heavy projects burden schools and may compromise performance of schools regarding core curriculum Case of shifting from sweetened tea to alcoholic beverages. Need to be mindful of such effects Insufficient reach of pilot studies may create inequality and be detrimental Credibility and support may be lost if project is not well-prepared at the outset

Abbreviations:
SE: socio-economic
SSB: sugar-sweetened beverages

6. Information collated from semi-structured interviews with national public health or education institutions of various EU Member States. See *Annex II* for interview structure details.



Evaluation is needed to assess how well an intervention has been conducted, whether it has delivered the intended results, and to determine its overall success. Two types of evaluations are to be considered:

- 1) **Outcome evaluation:** assesses whether the intervention has been effective and has led to the intended effect or change. Uses quantitative measures to determine effectiveness; for example, by measuring and comparing water intake or SSB consumption at baseline and post intervention in the intervention and control group.
- 2) **Process evaluation:** assesses whether an intervention was implemented as planned. This type of evaluation can explain why the intervention works and if/what particular components of the intervention contributed to the outcomes.

The RE-AIM framework⁷ and other similar tools^{8,9,10} can be used to evaluate the intervention process. *Table 7* exemplifies how an evaluation can be done in the case of a school environment change programme to increase water intake.

Table 7. An example of a RE-AIM framed evaluation of a school environment intervention to increase water intake through providing filtered, cooled water stations and free bottles for refilling.

RE-AIM components	Description ⁷	Example(s) in a lesson-based education programme	Additional Comments
REACH	The absolute number, proportion, and representativeness of individuals who are willing to participate in a given initiative, intervention or programme	• Number and percentage of schools receiving water stations and bottles • Number and percentage of children receiving a bottle • Characteristics and representativeness of schools and children taking part in the programme	Some studies look at dose delivered, dose received and reasons if dose not received
EFFECTIVENESS	The impact of an intervention on important outcomes , including potential negative effects, quality of life, and economic outcomes	• A measure of water intake (e.g. objective measure of consumption of water) • Change in water consumption before and after intervention, and difference between intervention and control group	Children's knowledge about location and function of water stations in this case will be important and should be looked at in the implementation evaluation
ADOPTION	The absolute number, proportion, and representativeness of settings and intervention agents (people who deliver the programme) who are willing to initiate a programme	• Number and percentage of schools/teachers/classes adopting the programme • Characteristics and representativeness of schools/teachers/classes that adopted the programme	Participation rate and characteristics of adopters vs non adopters can provide useful information
IMPLEMENTATION (at setting level)	Implementation refers to the intervention agents' fidelity to the various elements of an intervention's protocol, including consistency of delivery as intended and the time and cost of the intervention	• Number of water stations and bottles delivered; ease of access • Programme duration • Observation of the proper installation, functioning and maintenance of the water stations • Questionnaire to teachers/pupils to evaluate fidelity to protocol • Costs associated with providing water stations and bottles	Investigating on the need for adaptation of material/hardware; facilitators and barriers are other important aspects to consider

7. About RE-AIM: http://www.re-aim.hnfe.vt.edu/about_re-aim/what_is_re-aim/.

8. Linnan & Steckler, 'Process evaluation for public health interventions and research: an overview', in *Process Evaluation for Public Health Interventions and Research*, edited by Steckler A, Linnan L, San Francisco: Jossey-Bass, 2002, 1-23.

9. Grant et al, *Trials*, 2013, 14:15: <http://dx.doi.org/10.1186/1745-6215-14-15>.

10. Androustos et al, *Obesity Reviews*, 2014, 15:74-80: <http://dx.doi.org/10.1111/obr.12185>.

Table 7. (Cont.)

RE-AIM components	Description ¹¹	Example(s) in a lesson-based education programme	Additional Comments
IMPLEMENTATION (at individual level)	Implementation refers to clients' use of the intervention strategies	• Number of students bringing in their water bottle • Number of times the student used a water station per day/week/month • Amount of water consumed by the student	
MAINTENANCE (at setting level)	The extent to which a programme or policy becomes institutionalized or part of the routine organizational practices and policies	• Will the water stations be kept and maintained after the intervention is over?	
MAINTENANCE (at individual level)	Maintenance has been defined as the long-term effects of a programme on outcomes after 6 or more months after the most recent intervention contact	• Re-assess effectiveness (a measure of water intake as above) six months after the intervention has ended	



From evidence to action

The school-based measures to promote water intake presented in this toolkit as (a list of) successful interventions are based on a systematic and transparent literature search and selection of reviews. The effects of interventions by age, gender or socio-economic status are not reported in this summary document. However, *Annex III* (online only: <http://publications.jrc.ec.europa.eu/repository/handle/JRC100991>) holds information about individual interventions, the respective target groups, and effect sizes observed. Summarising the amount of evidence considered here required pragmatic decisions and judgements on what evidence to include and how to interpret and report it. It inevitably includes judgements made by the authors of the original publications and of the systematic reviews as well as by ourselves and our interviewees. Many of the systematic reviews considered for the writing of this report conclude that there is 'mixed evidence' in favour of one or another intervention; while some studies illustrated strong findings in improving children's water intake, some did not. Moreover, of those that showed positive intervention effects, many were only assessed or sustained for the duration of the intervention.

Policymakers must make decisions based on available evidence. Often public health interventions of sufficient scale and design to produce strong evidence are not feasible, resulting in a high level of uncertainty. Uncertainty about the potential impacts of policy decisions does not necessarily mean, however, that decisions and actions should not be taken. As suggested by some^{12,13} theory, causal models and observational evidence can be used within a transparent decision-theory approach to support rational public health-related decisions. Careful and continuous tailored monitoring and evaluation of the interventions implemented will then further inform the decision of sustaining their format.

11. About RE-AIM: http://www.re-aim.hnfe.vt.edu/about_re-aim/what_is_re-aim/.

12. Fischer *et al.*, *Journal of Public Health*, 2013, 35(4), 488–494: <http://dx.doi.org/10.1093/pubmed/fdto76>.

13. Threlfall *et al.*, *Journal of Public Health*, 2015, 37(1), 166–171: <http://dx.doi.org/10.1093/pubmed/fduo44>.



Closing remarks

It is our hope that this toolkit will help decision-makers to take actions in developing appropriate interventions to improve water intake in children and adolescents. Guiding children to develop healthy hydration behaviour from an early age can lead to profound health impact in later life. School is a key setting for children to learn about, engage in and thus practice healthy hydration. This toolkit presented examples of tried and tested methods to increase water intake of children and adolescents at school. Well-planned and implemented interventions coupled with appropriate evaluation will increase the chances of success in bringing positive changes to children's hydration behaviour.



Additional resources

Web resources cited in this document

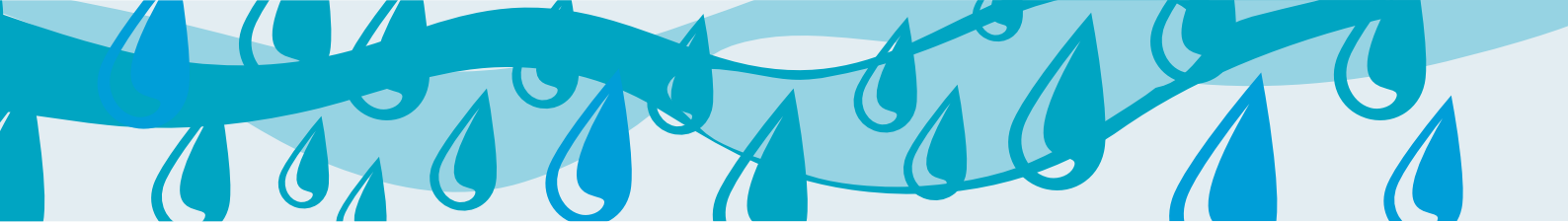
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Selected relevant EU projects

- JANPA (Joint Action on Nutrition and Physical Activity) – <http://www.janpa.eu>.
- I.Family (Investigating the determinants of food choice, lifestyle and health in European children, adolescents and their parents) – <http://www.ifamilystudy.eu>.
- IDEFICS (Identification and prevention of Dietary – and lifestyle – induced health Effects In Children and infantS) – <http://www.ideficsstudy.eu>.
- TOYBOX (Multifactorial evidence based approach using behavioural models in understanding and promoting fun, healthy food, play and policy for the prevention of obesity) – <http://www.toybox-study.eu>.
- ENERGY (European Energy balance Research to prevent excessive weight Gain among Youth) – <http://www.project-energy.eu>.
- NUTRIMENTHE (The effect of diet on the mental performance of children) – <http://www.nutrimenthe.eu>.
- EU SFVS (EU School Fruit and Vegetable Scheme) – http://ec.europa.eu/agriculture/sfs/index_en.htm.



Acknowledgments

We gratefully acknowledge the input from Austria, Croatia, France, Ireland, Malta, Norway, Slovakia, and Sweden regarding the implementation of school-based interventions to promote fruit and vegetable consumption.

Our work was informed and steered by the constructive support of an Advisory Group of experts: Estefanía Custodio Cerezales, Theodora Mouratidou, Jesús López Alcalde, Javier de la Cruz, and Artur Furtado.

Many thanks go to the team of Prof. Luis Moreno at University of Zaragoza, namely Iris Iglesia Altaba, Ester González Gil and Alba M^a Santaliestra Pasías, for conducting the literature search described in *Annex I*.

We are grateful to Ramón Sánchez Pérez de Lara and Manuel Florensa Molist for expert layout service.

Author contributions

Stefan Storcksdieck genannt Bonsmann and Tsz Ning Mak contributed to the conception and design of the project, acquisition, analysis and interpretation of data, and drafted and revised the toolkit.

Sandra Caldeira contributed to the conception and design of the project, acquisition of data, and drafted and revised the toolkit.

Jan Wollgast contributed to the conception and design of the project and revised the toolkit.

All authors read and approved the final toolkit.

ANNEX I

Identifying effective public health interventions to increase water intake or reduce sugar-sweetened beverage (SSB) consumption in children and adolescents

ABSTRACT

This is the protocol for an overview of successful public health interventions to increase water intake or reduce sugar-sweetened beverage (SSB) consumption in (pre-)school-age children and adolescents. The specific objectives of this overview were to: a) identify systematic reviews (SRs) of interventions to increase the intake of water or reduce the consumption of SSBs in children and adolescents (ages 3 to 18 years); b) extract from the SRs the interventions that demonstrated positive effects; and c) systematically summarise the measures used in those successful interventions.

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RESEARCH QUESTION

What concrete interventions are effective to increase the intake of water or reduce SSB consumption in children and adolescents (3 to 18 years)?

OBJECTIVES

The objectives were to:

1. Search the published literature for systematic reviews (SRs) and meta-analyses – hereafter collectively referred to as SRs – of interventions to promote water or reduce SSB consumption in children and adolescents (ages 3 to 18 years).
2. Extract those interventions that demonstrated positive effects, including information about the actual intervention and the effect size.
3. Systematically describe the measures used in successful interventions.
4. Provide information on cost and resources of interventions if available.

DESCRIPTION OF THE INTERVENTIONS

Interventions were classified according to the component(s) used. The focus was on interventions that were at least partly school-based, i.e. implemented in schools by teachers or hired personnel. This kind of programme ensures the participation of the children and gives the opportunity to combine different activities in one place that is a reference for the children.

LITERATURE SEARCH

INCLUSION CRITERIA FOR SRs

Types of reviews

We included SRs for the assessment of our main objective. Key characteristics of SRs are:^a

- A clearly stated set of objectives with pre-defined eligibility criteria.
- An explicit, reproducible methodology.
- A systematic search that attempts to identify all studies that would meet the eligibility criteria.
- An assessment of the validity of the finding of the included studies, such as risk of bias assessment.
- A systematic presentation and synthesis of the characteristics and findings of the included studies.

Only SRs rated 5 to 10 using the Health Evidence Quality Assessment Tool (HE-QAT)^b were included in this overview to guarantee a minimum quality of the results.

Types of participants

We only included interventions targeting children and adolescents aged 3 to 18 years. We considered evidence from developed countries worldwide (defined by the World Bank criteria^c). If a SR included studies from both developed and developing countries, it was included in the data extraction.

a. <http://handbook.cochrane.org>.

b. http://theevidence.org/documents/our-appraisal-tools/QA_tool&dictionary_18.Mar.2013.pdf.

c. <http://www.worldbank.org>.

Types of interventions

Bearing in mind the focus on school-based interventions, we included SRs that evaluated any intervention or combination of interventions designed to increase the intake of water or reduce SSB consumption in children and adolescents (3-18 years).

Inclusion criteria

- Focused on interventions that modified the main outcome, namely water or SSB consumption in children and adolescents (3-18 years).
- Scored 5 to 10 according to HE-QAT.
- Included interventions implemented in developed countries (if a SR included studies from both developed and developing countries, this SR was included in the data extraction).
- Included interventions targeting healthy and/or overweight/obese children.

Exclusion criteria

- SRs focussing on children with specific diseases or conditions with the exception of overweight and obese children and adolescents.

Types of outcomes

Fluid intake (water, flavoured water, sugar sweetened beverages): change in number of servings, change in number of portions, change in millilitres (ml). As this is the main objective of this review of SRs, we included those papers from SRs in which the intervention had any effect on the intake of water in children and adolescents.

SEARCH METHODS FOR IDENTIFICATION OF SRs

We followed the process detailed here to identify moderate to high quality SRs meeting the inclusion criteria. We searched the Cochrane Database of systematic reviews. In parallel, we searched the Healthevidence.org database for 'moderate' and 'strong' SRs (having been rated 5 to 10 with HE-QAT) using our search terms. We looked for SRs from the year 2005 up to mid June 2015 in these two databases.

In addition, we searched other databases (see list below) for SRs published in the 6 months prior to the end of the literature search period (June 2015) to ensure that recent SRs not yet listed in the Health Evidence database were included. The following databases were searched for this purpose:

- PUBMED
- OVID
- CAMPBELL
- ERIC
- ISI Web of Knowledge
- EMBASE

The search string used for all databases was the following:

(child* OR adolescent* OR youth OR young OR teen* OR student* OR girl* OR boy OR boys OR pupil* OR school OR schoolchild* OR school-age OR preschool OR primary OR elementary OR secondary OR middle-school) AND intervention* AND (water OR hydration OR sugar-sweetened beverage*) AND ("systematic review" OR "meta-analysis")

DATA COLLECTION AND ANALYSIS

SELECTION OF THE SRs

After applying our search strategy across the selected databases, we used the following 3-step selection process:

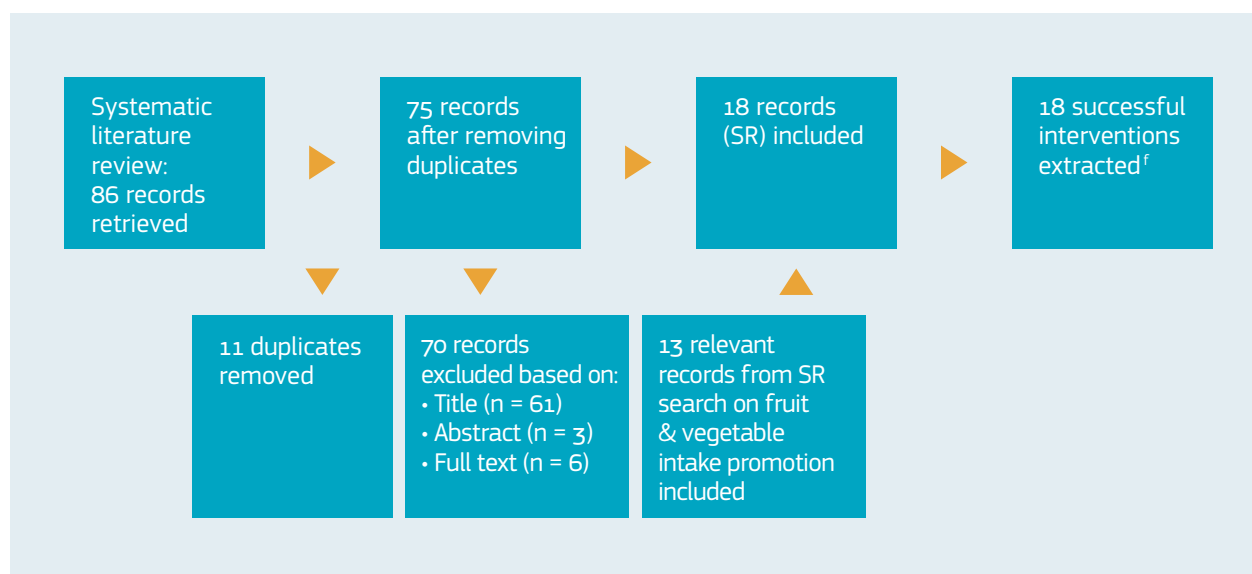
1. After removing duplicates we performed an initial screening by reading the title and abstract of all selected SRs.
2. Then we identified those SRs within the scope of the intervention approach and outcome (measuring changes in the water or SSB intake).
3. We excluded both SRs that did not have water intake or SSB consumption as a primary focus and SRs within the scope but considered of 'weak' strength according to HE-QAT.

We retrieved the full-text versions of those SRs that met the inclusion criteria (based on the title and abstract only). Two reviewers screened all full texts. Where there were differences of opinion, a third reviewer reviewed the paper and a consensus decision was taken between the three reviewers.

We assessed publications identified by the primary searches of relevance using the Health Evidence Relevance Tool for review articles as a pre-screening step consistent with Health Evidence methodology.^d SRs that were not on the Health Evidence database were rated using the HE-QAT and only those scoring 5 or higher retained.

Our search was limited to SRs published from 2005 to mid-June 2015.

Furthermore, relevant SRs resulting from a comparable search on school-based interventions to increase fruit and vegetable intake in children and adolescents were included.^e



PRISMA flowchart of the process for selecting Systematic Reviews (SR) and original publications to be included in the data extraction and synthesis.

d. http://healthevidence.org/documents/our-appraisal-tools/Relevance_tool&dictionary_18.Mar.2013.pdf.

e. Tsz Ning Mak, Stefan Storcksdieck genannt Bonsmann, Sandra Caldeira and Jan Wollgast, *How to promote fruit and vegetable consumption in schools: a toolkit*, EUR 27946 EN, doi:10.2788/678338.

f. Annex III (online only: <http://publications.jrc.ec.europa.eu/repository/handle/JRC100991>).

QUALITY OF THE INCLUDED SRs

All included SRs underwent a methodological quality assessment. In case a SR was not retrieved from the Health Evidence database, the HE-QAT score was computed and the SR discarded if it did not rate as 'moderate' or 'strong' (score 5 to 10).^g

QUALITY CHECK OF THE SELECTION OF SRs

An initial quality check was applied prior to the full selection of the SRs for data extraction to ensure a common understanding of the selection criteria. In this check, a reviewer different from the one who selected the SRs by title and abstract for inclusion reviewed 10% of the SRs to compare differences in inclusion criteria between reviewers. Based on this discussion, consensus was reached about the interpretation of the inclusion or exclusion criteria.

DATA EXTRACTION AND MANAGEMENT

Having selected all SRs that met the inclusion criteria, we identified 18 interventions analysed in the SRs that effectively increased water intake or reduced SSB consumption in children and adolescents (ages 3-18 years). Interventions were deemed effective if they achieved significant increases in children's water intake or decreases in their SSB consumption based on statistical analysis. Detailed information was compiled about the intervention measures used – including a thematic grouping into education, environment and parent/family measures – as well as the results for each outcome considered.

DATA SYNTHESIS

Two types of data synthesis tables were prepared from the selected effective school-based interventions. One contains detailed descriptions of the interventions, a rough categorisation of the study components used, the results, and references to the source publications.^h The other offers a detailed categorisation of the measures grouped by theme as follows.

- Education (4 subcategories; see *Table 1*)
 - Classroom-based information
 - Experiential learning
 - Games/competitions (+/- rewards)
 - Behaviour change approaches
- Environment (3 themes; see *Table 2*)
 - Availability of water
 - Restrict access to SSB
 - Changes at Point of Purchase (POP)/Point of Contact (POC)
- Parental/family involvement (see *Table 3*)

All effective interventions can be searched and filtered by theme(s) of interest using an integrated filtering system.^h

g. http://healthevidence.org/documents/our-appraisal-tools/Relevance_tool&dictionary_18.Mar.2013.pdf.

h. Annex III (online only: <http://publications.jrc.ec.europa.eu/repository/handle/JRC100991>).

ANNEX II

Questionnaire for semi-structured interviews with national public health experts

We conducted six semi-structured telephone interviews with national representatives from public health or education institutions of various EU Member States to gather their views and experiences on a number of implementation issues associated with school-based interventions for promoting water intake or reducing SSB consumption. Three were related to education components of school-based interventions that targeted water intake or SSB consumption behaviour in children (Cyprus, Hungary, Slovenia), and three were related to environment interventions (Bulgaria, Latvia, Netherlands). The table below illustrates the standard questions presented to the interviewees.

1. What are the stakeholders that you consider important to involve in this type of interventions?
2. Are there any acceptability issues that one should consider vis-a-vis the stakeholders identified above?
3. Can you envisage resistance from any of them? Can it be overcome?
4. And what about support? Who would be the main supporters?
5. Is it feasible to conduct the intervention in the context of your country/region/municipality?
Yes – any comments?
No – why not?
Yes, BUT (please state limiting factors and leveraging factors)
6. Is it feasible to conduct the intervention in the context of your country/region/municipality?
Yes – any comments?
No – why not?
Yes, BUT (please state limiting factors and leveraging factors)
7. Can we assume this type of interventions to be sustainable in the context of your country/region/municipality?
Yes – any comments?
No – why not?
Yes, BUT (please state limiting factors and leveraging factors)
8. Can you identify putative side effects (beneficial or harmful) for this type of school based interventions?
9. Linked to all above, apply the equity lens on this type of interventions, *e.g.* any gender or socio-economic status effects we should consider?

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